PROFESSOR MAX WESTENHÖFER ON THE PROBLEM OF MAN'S ORIGIN*

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MAX WESTENHÖFER, M.D., Professor Emeritus of the University of Berlin, was born at Ansbach, some 25 miles south-west of Nuremburg on January 9th, 1871. He has on several occasions expressed strikingly individual views regarding the origin and evolution of man. These were first published in the form of a series of papers in German medical periodicals, as well as in the *Zeitschrift für Saugetierekunde*, and subsequently in Spanish in a number of South American scientific journals.†

His ideas were brought together in a small book of 106 pages, the second edition of which appeared almost two decades ago.[10] Seven years later this was developed into a more substantial volume about four times as long as its predecessor.[11] The advent of the last work in the middle of the second world war was hardly propitious for the diffusion in his native land—and still less in the occupied countries of Europe—of the author's concepts. Had it not been for the friendship that had existed between us since 1937, when Westenhöfer on his return from Chile paid me a visit in Brussels, I should have been acquainted only with the epitome of his views published in 1935. But sympathy, born of certain scientific opinions held in common, caused him to make available to me a copy of his work of 1942 during the military occupation of Belgium. After the war, still imbued with his ideas, he wrote a new book in which were set out the bases of his theory of the intrinsic course (*Eigenweg*) of human evolution.[12] In 1951 an augmented Spanish version of this was published in Santiago, where Westenhöfer has now settled, under the title of *El camino propio evolutivo y el origin del Hombre*. As I have indicated, however, the essence of his doctrines is to be found in the brief exposition he gave of them in 1935, and the object of the present review is to bring these, even more summarily, to the notice of English readers who may not be aware of Westenhöfer's novel outlook on anthropogenesis.

General Considerations

Westenhöter's researches have led him to dissent from the current view of what might be called the simian origin of humanity, and to hold that man comes from a stock peculiar to himself. The trunk of this would be directly connected with the root from which all mammals have sprung and would differ but slightly from their prototype. Westenhöfer finds support for his notion of the structural "primitiveness" of man in the development of the brain and the skull. In 1935 he voluntarily restricted himself to a consideration of structure, at the same time recognizing the importance of the philosophical, psychological, and cultural approaches to the problem of man's origin. The work published in that year is thus an essay on human *morphogenesis*. The first part of it is largely concerned with the brain and the skull, and with the carriage of the head and the posture of the body in man.

A study of the human chin leads the author to suppose that mammals are committed,

* Translated by R. Crewe-Clements, Esq. In 1953 Dr. Frechkop was responsible for a 52-page condensed and annotated French edition of Westenhöfer's *Das Problem der Menschwerdung* under the title of *Le problème de la genèse de l'Homme* (Éditions Sobeli, Rue du Boulet, Brussels). Otherwise, apart from a review by Professor Vallois in *L'Anthropologie*, Vol. 54 (1950), pp. 127-9, of *Die Grundlagen meiner Theorie vom Eigenweg des Menschen*, the opinions of this unorthodox but stimulating thinker do not seem to be generally known in Western European countries.—ED.

† A full bibliography of his publications on the subject of human evolution up to and including 1942 is given in Westenhöfer (1948), pp. 254-5.[12]

as it were, to an evolutionary path tending towards the formation of a large brain; this tendency is countered in proportion as dentition becomes more powerful. Here Westenhöfer cites Fick,[2] who had observed (just over a hundred years ago) that, in the initial stages of their development, all mammals display an organization superior to that which is achieved with completed growth. According to Westenhöfer, this is not too difficult to explain: of all organs, it is the central nervous system that grows least during the period between birth and adulthood; the jaws, on the other hand, undergo their greatest development in the course of the same period. Consequently the respective degrees to which the brain and the face have been developed are in inverse proportion among the majority of mammalian forms. In other words, the greater the development of the brain, the less that of the face, and vice versa.* Granted that the brain case and its contents have developed at the expense of the facial skeleton or "snout," would it not be strange if Nature had facilitated in advance the development of such a snout? As long as man's evolutionary past continues to be represented in the manner of Thomas Henry Huxley[4] by a simple series comprising the skeletons of the gibbon, the orang-utan, the chimpanzee, the gorilla, and *Homo sapiens*, then it is clear that not all the peculiarities of the human bony frame will be taken into account. On the other hand, the fact noted by Virchow that the likeness between the anthropomorphous apes and man is never so marked as it is during their extreme youth, should not be underestimated.

In conformity with the inverse ratio between the brain case and the jaws, the supply of blood to these different parts of the head must be unequal in man and in the apes. And as a matter of fact, the cerebral arteries are developed to a greater extent in the human brain than in that of any other mammal. A more plentiful blood-supply has thus made man's exceptional cerebral development possible. The well-known odontologist P. Adloff attributed the progressive reduction in the number of teeth during the rise of the vertebrates to the passage from an aquatic to a terrestial existence, and this, according to Westenhöfer, carries the problem back to the very early stage in the evolution of the vertebrate line. In short, the study of human morphogenesis ought logically to begin at the beginning of the lower vertebrates and not at the stage reached by the apes. Its start, then, should be an animal such as the lancelet or *Amphioxus*,† which, while lacking a head in the accepted sense of the term, already possesses an *archencephalon* or enlargement of the anterior extremity of the neural tube. Among the vertebrates the development of this part of the nervous system observes the following rule. It is known that where a part of the body can develop freely, without hindrance from adjacent parts, it assumes a shape that will enable it to attain its maximum functional efficiency in a minimum of space; expressed otherwise, the greatest volume consistent with the least surface area, or the form of a sphere. This is precisely the case in the primordia‡ of the sensory organs and of the encephalon or brain. Now, the globular form of the embryonic encephalon determines the flexion or bending, in a ventral direction, of the anterior proximity of the dorsal chord. In the embryos of all vertebrates, flexion of the base of the skull (*basikyphosis*) is observable, even though it may later on undergo modification. Among the lower vertebrates the various flexions of the neural

* This is well illustrated by a series of sagittally sectioned skulls of man, the orang-utan, the chimpanzee, and the gorilla, such as Professor Westenhöfer was shown in the Liverpool Free Public Museum on his return voyage from Chile to Germany at the end of November 1932. A photograph of the exhibit, given to him by the Curator, Dr. Douglas A. Allen, is reproduced more than once in his writings.

† *Amphioxus* (literally "pointed at both ends") *lanceolatus*, a fishlike marine creature about 5 cm. or 2 in. long, is found in shallow sandy reaches of the sea coasts. It is almost transparent, and although it has no jointed vertebral column an unjointed dorsal stiffening rod or "notochord" runs the length of its body.

‡ The "primordium" (Fr. *ébauche*, Ger. *Anlage*) is the first recognizable but structurally undifferentiated stage in the development of an organ.

tube eventually disappear and the curved base of the skull becomes straightened. In the case of the higher vertbrates, however, the flexion of the cranial base persists. The striking resemblance shared by the embryos of all amniotic or land-dwelling vertebrates is likewise shown in the primordium of their nervous system.

course of the growth of man and the anthropomorphous apes are admirably summarized in Fig. 1, which is taken from a remarkable study by Professor Adolph H. Schultz.*[6] In Westenhöfer's opinion this schematic representation alone should be sufficient for an unbiased mind to discount any idea of simian antecedents in man's ascent. While

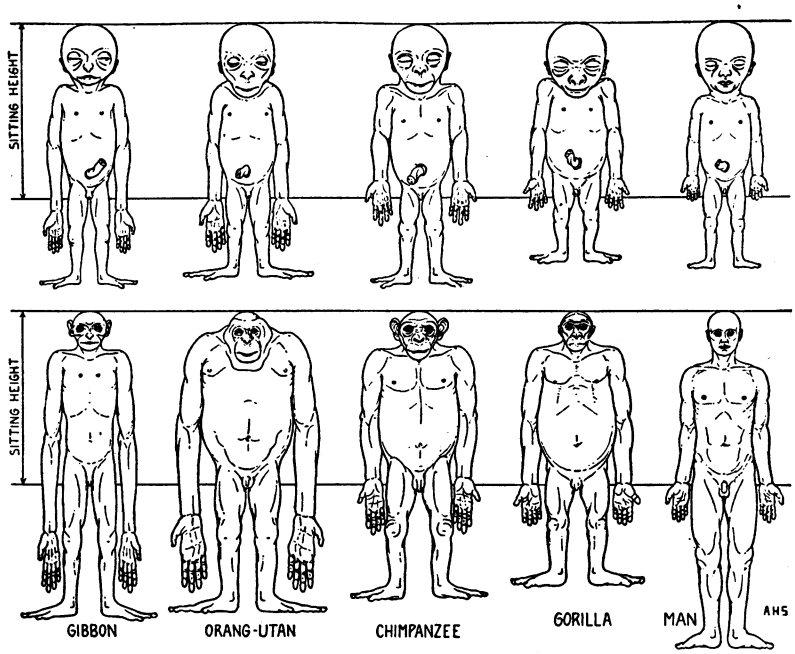

FIG. 1. Bodily proportions of the anthropomorphous apes and man in the fœtal and adult stages (after Schultz, 1926). The fœtuses (*above*) are arranged in the same order as the adults (*below*), all being given identical vertico-perineal sitting heights. The human fœtus is in the fourth month, and the gibbon and gorilla fœtuses are in corresponding stages of development. The orang-utan and chimpanzee fœtuses, however, are slightly more advanced in growth.

As far as the mammals, in particular, are concerned, the earlier the embryonic stage the greater the similarity in appearance among the different kinds: head round and capacious in relation to the body; jaws, mouth, and nose, i.e. the snout, projecting slightly if at all from underneath the brain case; and, most significant according to Bolk, the primordia of the teeth "orthodont" or vertical. During intra-uterine life the relation between the head and the body is gradually altered, and this process continues after birth until the adult stage has been reached. The changes in proportion in the the apes exhibit, if not degeneration, at least a sort of aberrant development due to exaggerated unilateral specialization of the forelimbs for progress by swinging from branch to branch in the trees, man preserves to the fullest degree the fundamental relations of growth.

* Readers of the EUGENICS REVIEW may be interested to learn that Professor Schultz, for many years Director of the Laboratory of Physical Anthropology at Johns Hopkins University, has returned to his native Switzerland to occupy Rudolf Martin's chair at Zürich on the retirement of its distinguished holdér, Professor Otto Schlaginhaufen.—ED.

It is widely recognized that the marked development of the part of the mammalian skull that houses the brain is closely connected with the volume of the cerebral hemispheres and with the extent of the neopallium, the name given to the cortical area of associative memory by the late Sir Grafton Elliot Smith,[7] who has also discussed both the role it played as an essential factor in the rise of the mammals, and the problem of its origin.[8, 9] The volume of the brain in turn determines the degree of flexion of the angle at the base of the skull and the size of a second angle formed by the vertebral column with the basal portion of the occipital bone (*occipital kyphosis*). As the snout lengthens to outstrip the cerebral part, so retarding its development, these angles become modified and tend to disappear, in consequence of which the head is carried in a way that demands eventual realignment if the quadruped is to see in front of it and not to have its vision firmly fixed on the ground. The most suitable carriage of the head is a product of the sense of sight: the direction of the optical axes, which are situated in a plane almost parallel to that of the palate,* determines the position of the head. If quadrupedal animals can keep their optical axes in the horizontal plane, as man does in his bipedal posture, this is to be attributed to modifications of the vertebral column which they undergo in the course of embryonic development. To walk tetrapodally "on all fours," however, man must throw his head back, exaggerate the cervical curve of his spine, look upwards, and wrinkle his brow. At the same time his thigh is brought close up to his belly, his knee becomes bent, his heel is raised from the ground and his foot therefore digitigrade, and his typically human lumbar curve (*lordosis*) becomes convex backwards or a stoop (*kyphosis*). The organs of the senses of postural activity or balance, situated in the petrous part of the temporal bone, and particularly the lateral semicircular canal, also influences the carriage of the head and the posture of the body. Problems of this nature have been raised in the past, and Westenhöfer is mindful of the fact that the celebrated anatomist and surgeon Sir Charles Bell[1] had considered them more than a century before him.†

The Brain

The second part of Westenhöfer's *Das Problem der Menschwerdung* deals more exclusively with the brain. In it he expresses the opinion that a comparative series of animal brains proves nothing in regard to the genetic affinities of their respective possessors. All likenesses or unlikenesses, whether in the coarsest or the most delicate cerebral structures, are related far more to the particular characteristics of the different animals than to the bonds of relationship that unite them. Substituting for the *anatomical* dichotomy of the nervous system into peripheral and central parts, a kind of fourfold *physiological* subdivision, the control of the functions of which is situated in the central nervous system (a point of view in agreement with the Judson Herrick theory of nerve components[3]), Westenhöfer says that the behaviour or mode of life of an animal depends on the functioning of its brain and vice versa. In this way a number of otherwise incomprehensible facts can be explained: for example, the fact that the cerebral cortex is often more developed in fishes than it is in amphibians but never so much as it is in reptiles. Morphologically, the changes in the archipallium (*palencephalon*) are expressed by different modifications in size and structure. Thus the thalamus or receiving region of the midbrain, which is the principal link between the great cerebral hemispheres and the most deep-seated parts of the central nervous system on the one hand, and the sense-organs on the other, harbours a very variable quantity of ganglia or nerve centres: their

* There are some exceptions to this rule, for instance the baboon, in which the plane of the palate forms quite a sensible angle with the visual plane.

† "*Bell on the Hand*" is the fourth of the famous eight Bridgewater Treatises "On the Power, Wisdom, and Goodness of God, as manifested in the Creation," for the authors of which the last Earl of Bridgewater left £8,000 to be paid by the Archbishop of Canterbury and the President of the Royal Society of London.

number steadily increases until the stage attained by the monkeys is reached, and it falls abruptly to about a quarter in the chimpanzee and man. In the hypothalamus, or portion of the mid-brain concerned with emotional expression and visceral response, there is an area which regresses considerably in the ascending series of mammalian forms, the number of ganglia dropping from thirty in the rabbit to only two in man. The perfection of the intelligence, therefore, corresponds to a decline in the importance of the instincts whose centres are situated in the mid-brain.

Westenhöfer then proceeds to show by examples that the study of brain weights, whether absolute or relative, is of no avail in contributing to the solution of the problem of inter-specific relationships. Similarly, the respective numbers of convolutions do not express the functional potentialities of the brain. Among the lower vertebrates the cerebral cortex is composed of two layers of cells, while among the mammals, at least in the " neo-cortical " zone, it is composed of six. But no transition occurs from the two layers of the fishes, amphibians, and reptiles and the six layers of the mammals, apart from the whales, which have four. The structure of the cerebral cortex ought thus to be recognizable at an early stage of embryonic development. In regard to the structural delicacy of the brain, the ape, when compared with man, appears to be rather a vestige of man's ancestral line than his predecessor. Professor Winthrop N. Kellogg's experiment with his ten-months-old son and a chimpanzee of the same age seems to Westenhöfer to provide an indirect confirmation of this view: for eighteen months the chimpanzee showed itself to be a veritable " infant prodigy," and not until after this time was the ape overtaken by the boy.

The differences in mentality and in conceptions of the external universe among men does not depend on the size of the brain but on the minutiæ of its structure and on the development in it of " channels of association " (*neurobiotaxis*). So-called " savage " peoples are no less intelligent than civilized ones: the brain, the instrument, is there, and it remains only to know how to use it. Of the same order of ideas, it is clear that language, as Westenhöfer stresses, is not inherited but has to be learned anew, generation after generation, by each individual. On the other hand, progress is not attributable to the mass but always to individuals who nevertheless differ in certain respects from the majority, and it is often achieved at the cost of a desperate struggle between such individuals and the mass. As a characteristic human feature, the intellect has perhaps been less important than the newly acquired capacity to subdue the desires and instincts, the capacity to develop as much for his own as for the social good a usefully directed will and activities, the capacity to form his character and to become himself a " personality." In Westenhöfer's eyes, character and will are to some degree constant elements, guardians of the brain and, in general, of the entire personality.

The Skull

The third part of the work that is summarized in this article relates almost wholly to the skull. The cranial base plays an extremely important role in the development of the facial portion of the skull. A child's head in sagittal section reveals the cartilaginous junction between the basi-occipital element and the sphenoid bone, the second of which is itself made up of two parts united by cartilage. Without the existence of these cartilaginous " joins," the growth of the base of the skull would not be possible. Coinciding with the successive shifts of the occipital bone, its squama assumes an almost horizontal position, and in the more rounded shape of that of the infant and the female Naef[5] saw the future form of the human skull. According to him and to Schindewolff, the male skull has *preserved* the simian aspect of the forehead; for Westenhöfer, on the contrary, it has *acquired* this. Judged by the dimensions of the inter-orbital breadth, man has remained more primitive than the apes. In the newborn child, too, the masticatory

arcades are semi-circular, whereas among the brutes they lengthen and acquire first an ellipsoid shape and finally that of a V. The arrangement of the folds of the mucous membrane of the hard palate is correlated with this process of events. Like Bolk, Westenhöfer considers that the chinless opposition to current belief, he holds that the prognathism found in apes must be accepted as having originated from less prognathous conditions. The orthodonty of man's permanent incisor teeth represents a state that functionally precludes the formation of a snout.

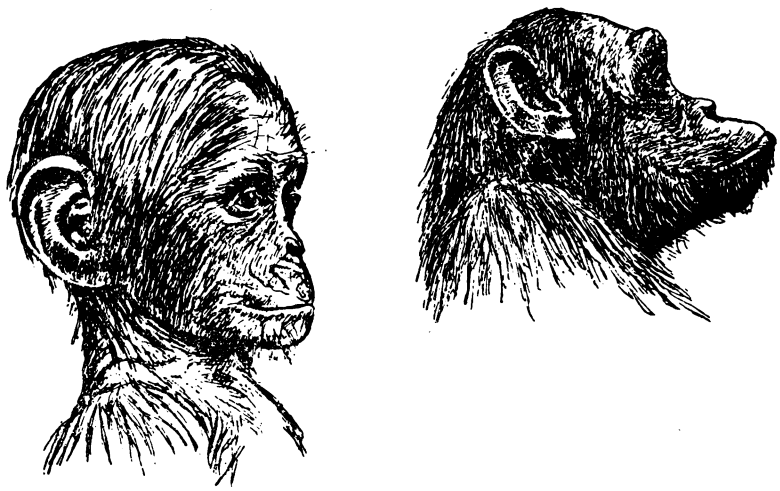

FIG. 2. Profile sketches, not to scale, from photographs of the heads of *(left)* a still unweaned young male Congo chimpanzee, *Pan troglodytes schweinfurthi* (giglioli), and *(right)* an old animal, also from the Congo, of the same subspecies and sex (after Naef 1926).

mandible comes from a lower jaw having a well-developed chin, the mental ossicles being primitive elements.*

As Bolk has emphasized, the majority of mammals in the embryonic stage exhibit a condition in which the teeth are implanted vertically in the jaws (orthodonty). Among the monkeys and apes, and more especially the anthropomorphs, those of the milk set are vertical, and it is only after they have been replaced by the permanent dentition that alveolar and dental prognathism is established and the resemblance borne by these animals to man diminishes (Fig. 2). As far as the human canines are concerned, Bolk thinks it impossible to regard them as secondarily simplified teeth, and, in

* Westenhöfer claims that man is the sole possessor of a chin, but its sporadic occurrence in *Symphalangus syndactylus* or the siamang gibbon, which is confined to Sumatra, has been noted both by Bolk and, somewhat later, myself.

The Origin of Man

In the final part of his book Westenhöfer discusses the problem of anthropogenesis, considering that in the organization of the brain alone the possibility of achieving a higher development lay open to all the mammals. This, however, reached its most complete expression only in man. The explanation of man's special nature is consequently to be sought in his cerebral development, and here account must first of all be taken of the original combination formed by a primordial brain and a bipedal posture, as well as of the visual plane corresponding to bipedalism. Now, the orthograde position can be attained only if the rest of the bodily structure makes it possible: conformity of the hind (in man the lower) limbs; a characteristically arched primitive foot and a calcaneum or heel touching the ground; an upright vertebral column with a

lumbar curve*; a thorax which is not flattened in the transverse direction; a hand retaining the primitive form that is still found in the embryonic stages of monkeys and apes (Klaatsch); teeth also showing primordial features (Klaatsch, Adloff, Bolk); head resting without special muscular support on the vertebral column, a fact which enables the brain to conserve a shape and relative volume that are almost fœtal.

Westenhöfer believes that all the mammals were originally but transitorily orthograde in the course of evolving from ancestors that resembled amphibians; in other words, he accepts an initial mammalian bipedalism. The assumption of a bipedal gait liberated the hand from its role as an organ of support and locomotion, and the importance of this freedom has always been taken at its true worth (Anaxagoras, Galen, Sir Charles Bell). As the result of his manual liberty, which made the use of tools possible, and the development of his brain, man has been able to shake off his dependence on the environment and modify this according to his will. The acquisition of articulate speech is in harmony with the freeing of the hand. The array of facts and considerations this set forth leads Westenhöfer to regard man alone of all the mammals as the least removed, morphologically speaking, from their hypothetical prototype.

* Lumbar curvature, as well as an arched foot, are not sufficiently developed in the tarsier, the gibbon, etc., for their bipedalism to be as complete as that of man.

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